

Engineering Heritage Australia

THE INSTITUTION OF ENGINEERS, AUSTRALIA

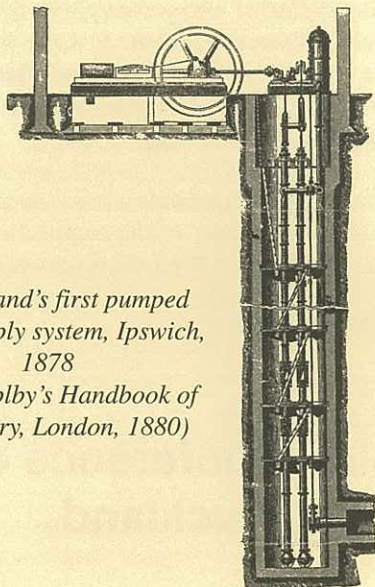


Newsletter of the National Committee on Engineering Heritage

No. 8 November 1998

Queensland's Early Waterworks

The Queensland Department of Natural Resources has recently released the above book, written by Professor Ray Whitmore. When Queensland separated from NSW in 1859, typhoid and other water-carried diseases were common, largely because there were no reticulated water supplies. But the people demanded, the politicians argued, the local councils schemed, the engineers planned, and by 1880 the six main towns - Brisbane, Maryborough, Rockhampton, Ipswich, Toowoomba and Warwick - all had waterworks. Some of them worked well, some did not, but the intense arguing and bickering that they caused before, during, and after their construction is a fascinating chapter in the social and public history of the State that has never been told before.



*Queensland's first pumped water supply system, Ipswich, 1878
(from Applby's Handbook of Machinery, London, 1880)*

Central to these developments were three hydraulic engineers, Thomas Oldham, Joseph Brady and William Highfield, and one engineer-turned-politician, Thomas McIlwraith. The book explores their personalities and ambitions through their letters and reports, and Whitmore discovers that not all engineers live blameless lives, Highfield terminating his public service with a spell in jail !

Whitmore's research uncovered a considerable amount of previously unrecognised archival material. The book is comprehensively referenced and includes a modern survey of each of the sites described. Although its breadth and authority will ensure that it becomes an indispensable reference work on Queensland's early water supplies, the flowing, well-rounded text, profusely illustrated with maps and plates, makes the book an essential read for everyone interested in the history of early Australian engineers and town water supplies

The price of *Queensland's Early Waterworks* is \$25 and copies may be ordered direct from: Department of Natural Resources, GPO Box 2454 BRISBANE, QLD 4001. Phone enquiries to Tim Hudd (07) 3896 3202.

Heritage Plaquing of Taieri Gorge Railway in Otago

On 6 June 1998, Gretchen Kivell, President of the Institution of Professional Engineers New Zealand, dedicated two Heritage Plaques on the Taieri Gorge Railway in Otago. One plaque is at Dunedin Railway Station and the whole party travelled the length of the track to make the second unveiling. The event was one of several associated with the 150th Anniversary of settlement by Europeans in Otago. It was well attended, including many delegates from the Local Government Conference in Dunedin.

The line is part of the former Otago Central Railway for which construction began in 1879 and was completed in 1887. There are 15 viaducts and bridges, and 8 tunnels on this segment of the track. The longest viaduct, at Wingatui, is 147m long and 47m high. It was designed by W N Blair and P S Hay of the Public Works Department and was built by R S Sparrow & Co., of Dunedin.

This newsletter is published by the National Committee on Engineering Heritage of the Institution of Engineers, Australia. Please contact us on fax (06) 273 2358 or visit our web site at <http://www.ieaust.org.au>

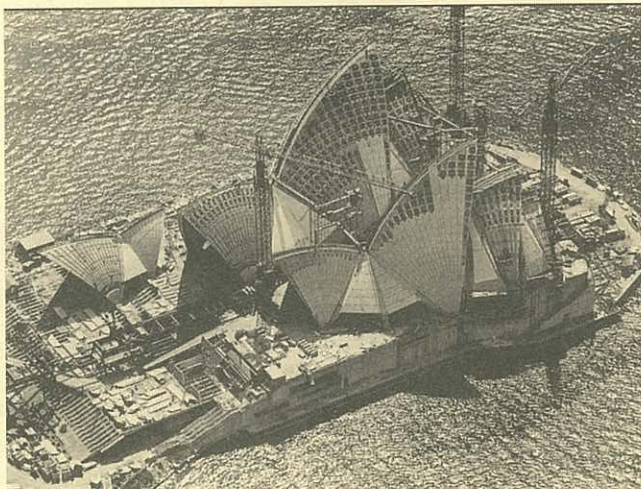
INSIDE this edition

Opera House Act One	2
2nd Australasian Conference on Engineering Heritage	2
Eminent Queensland Engineers	2
The River Murray Crossings	3
Historic Bridge Survey	3
Heritage Compressor	4

A Vintage Steam Engine	4
Lancashire Boilers at the Foureux Brewery	5
9th National Conference on Engineering	5
The Parkes Radio Telescope - a National Engineering Landmark	6
Heritage on the Web: IEAust Heritage Home Pages	6
Dams on the Cotter	7
Kingston Power Station	7
The Overland Telegraph	8

Opera House Act One

Opera House Act One is a new and fascinating book published in 1997 by David Messent, about the design and construction of Sydney Opera House. Starting with the history of the site, it progresses in detail through solving the many engineering problems, construction of the podium and roof, and concludes with placement of the tile lids. The book does not cover the departure of Utzon, the glass walls or the design of the interior. This probably explains the title.



Opera House One, an invaluable historical account of the engineering design and construction of one of the most significant buildings of the century.

Messent's research has been thorough - through the Arup Library in London, the Dennis Wolanski Library in Sydney, the papers of the late Prof. Harry Ashworth and Stan Haviland, and interviews with (in particular) Corbet Gore, Bob Kelman, John Blanchard, Sir Jack Zunz and John Nutt. The book includes, with acknowledgement, extracts from previously published works.

The dedication is for Corbet Gore, Hornibrook's Construction Manager of Stage 2. To quote Jack Zunz "For sheer skill, coupled with an ability to manage people and for getting the Opera House shells built, he deserves all the credit. We were proposing to build something which was very unusual and very difficult, and unlike most constructors, he turned round every problem and treated it in a positive way... It was Corbet who came up with the ideas for the special lifting tackle. Then the idea to cast the segments with matching surfaces, which had a most profound effect on the very quality of the look of the Opera House, was also his... I could name a hundred and one other different things".

Opera House Act One collects in one place, numerous significant records and comments from those who were involved. As such, it is an invaluable historical account of the engineering design and construction of one of the most significant buildings of the century. It provides not only an important case study in construction management, but gives an intimate insight into the care and the genius that gave us the Opera House, which is fundamentally, an engineering structure.

Eminent Queensland Engineers Volume 2

In 1984 the Engineering Heritage Panel of the Queensland Division, produced a volume entitled *Eminent Queensland Engineers* featuring 34 entries of deceased engineers.

The Panel is now working on Volume 2, which will include engineers who died prior to 1994, on the assumption that any of the engineers working in the twentieth century must have been Institution members or have held equivalent qualifications. Many manuscripts have been received and about 45 entries are being considered. Each entry will be accompanied by a portrait.

The target for publication is Engineering Week in September 1999.

The 2nd Australasian Conference on Engineering Heritage, Auckland, February 2000

The Conference will be held from Monday 14th to Wednesday 16th February 2000 with the theme **'The Past in the Future'**. It will be preceded by a pre-conference tour from Friday 11th to Sunday 13th February.

The organisers aim to encourage as wide a participation as possible, including engineers, architects, archaeologists, conservators, historians and social scientists.

Included in the program will be a forum for discussion of heritage issues and visits to significant heritage sites, as well as an interesting social program for accompanying persons.

The pre-conference tour of three days and two nights will visit hydro and geothermal power stations, and works associated with

the railways, timber industry and gold mining, as well as cultural venues in the Rotorua district.

Other events in Auckland close in time to this conference are the America's Cup Defence a week later in February, and the 12th World International Conference on Earthquake Engineering two weeks earlier.

For further information, please contact:

Prof P G Lowe
Dept of CaRE
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University of Auckland
Email p.lowe@auckland.ac.nz

More Bridges

The River Murray Crossings

The road crossings over the Murray River have been classified as being of National Significance, and recommended for inclusion on the Register of the National Estate, according to a recent assessment prepared for the NSW Roads and Traffic Authority.

The crossings constitute a unique collection of the bridge history of the country from the middle of the 19th Century, with fine examples of lift spans, timber trusses, and all materials, iron, steel, timber, and concrete. As well as technological history, they also show the social history of the expansion of the adjacent colonies, and the rivalry that existed in developing the rich farmlands of the Riverina. They also exemplify the stages of transport to markets, through river, rail, and road.

The study, by consultants Hughes Trueman Reinhold, also included recommendations on the philosophical and practical aspects of the maintenance of heritage bridges and ferries, while integrating the preservation of heritage significance.

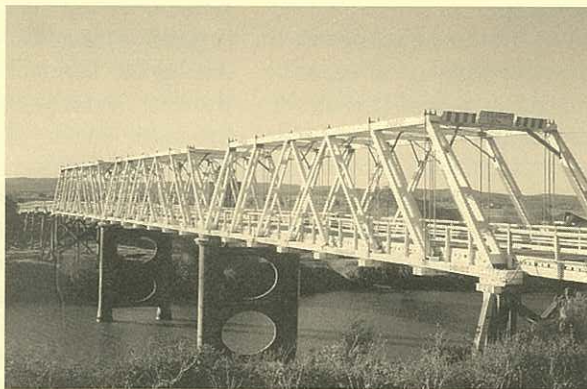
For more information contact Hughes Trueman Reinhold
(02) 94392633 or email egtrueman@ibm.net



Road crossing over the Murray river - a unique collection of the bridge history of the country from the middle of the 19th century.

Historic Bridge Survey

The Roads and Traffic Authority of NSW (RTA) has a large population of historic bridges built during the second half of last century and up to World War 1. One important group is the 77 timber truss road bridges, all that remain of the original 410. As recently as 1985 there were 110, such has been the mortality rate, and it is continuing because seven of the current survivors will be replaced by the end of 1998.



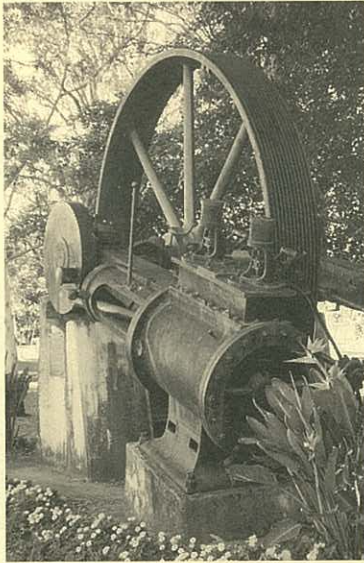
Morpeth Bridge (1898), Hunter River

Alerted to this situation, the RTA has commissioned a heritage survey of these bridges from Sydney consulting engineers McMillan Britton & Kell. Historic bridges specialist Don Fraser visited every site, taking photographs and noting any unusual features. The information gathered will be entered into the RTA data base and will be accessed, along with other data such as traffic densities, maintenance and replacement costs, as part of their asset management process.

Timber truss road bridges were a staple structure of the NSW Department of Public Works (PWD) from 1860 to 1914 due to the high costs of iron or steel bridges, departmental budget constraints and the availability of ironbark and other species of structural hardwoods. The use of timber was such that by the turn of the century, NSW was referred to as "Timber Truss State"

For more information contact Don Fraser at Sydney Division.

A Vintage Steam Engine in Toowong, Brisbane



The sawmill's steam engine, now at rest in a verdant setting

In 1875 Charles Patterson established his sawmill in Toowong, Brisbane. By the turn of the century it had grown in size and a variety of milling machines was installed. A powerful engine was needed to operate the plant and the unit selected was built by AUSTRAL OTIS ENGINEERING PTY LTD of Melbourne in 1901. It was a 2 cylinder, double expansion, compound steam engine and still exists.

The original Imperial dimensions are: the pistons are 24" and 16" diameter respectively; their stroke is 36"; the huge flywheel/main drive pulley is 15 ft 00 inches diameter and is mounted on a 9 inch diameter shaft; and the flywheel weights 20 tons. The rim of the flywheel is 1 foot 10 inches wide x 3 1/2 inches thick. Cored into its outer surface are 12 vee-grooves, to accept 12 ropes of 13/8 inches diameter. These rope belts propelled a heavy main counter shaft from which the drive was transmitted through flat leather belts and further counter shafts to the complex of machinery.

After a major fire in 1942, the steam-powered drive was abandoned and the engine stood idle for the next 38 years. Then in 1980, to mark the 75th Anniversary of Rotary International, the Rotary Club of Brisbane West organised the transfer of the engine to the nearby Oakman Park.

Heritage Compressor

Since being retired from duty in 1972, one of the original refrigeration compressors installed at Castlemaine Perkins Brewery in 1919/20 has been retained in the position it had occupied during its 53 years of continuous, arduous service. Though it is now stationary, it still attracts many interested glances. In its working life, it used to fascinate car, tram and train travellers and pedestrians alike. It was a familiar sight in the evenings to see Mums and Dads, with their children dressed in pyjamas, standing in front of the glass panels and staring at the turning wheel. Such was the fascination of the Big Wheel that it was regarded as synonymous with the "XXXX Brewery".

The 'Big Wheel' was the flywheel of a 75/90 ton Refrigeration Compressor. It was manufactured by the Lightfoot Refrigeration Company of London in 1918 and installed in 1919/20 by its Brisbane Suppliers, Wildridge and Sinclair.

Measuring 4.8 metres in diameter and with a mass of 15 tonnes it is mounted on a 30cm diameter shaft. 'The Big Wheel' began operating in 1920 powered by d.c. electricity from the Brisbane Tramway system.

Before the change-over to a.c. power in 1926 the 112 kilowatt electric motor driving the 'Big Wheel' used to draw so much

power at the start-up, that some of Brisbane's electric trams stopped. This situation was relieved by the installation of a 11,000 volt sub-station by the City Council on the Brewery's property. This sub-station is still part of the present installations with the Company providing its own transformers for reducing voltages to the required level.

The Compressor, motor, wheel and ancillary items cost £8,834 (\$17,668) in 1919/20. The cost of foundations and electric connection to the Brisbane Tramway system amounted to a further £1,300 (\$2,600).

The design of the double-acting piston type Compressor capable

of producing 75 tonnes of ice per day was based on a design by the inventor of Ammonia Refrigeration Compressors, C P G Linde of Germany. In fact the machine was and is still referred to as the Linde-Lightfoot Compressor.

Some years after its installation, the Compressor was required to work harder to cope with increased demands. Its capacity was increased from 75 tonnes of ice per day to 95 tonnes by increasing the size of the motor to 150 kilowatt. Transmission was through a double-layer flat leather belt which measured 19.2 metres (63 feet) long, 0.56 metres (22 inches) wide and 9.5 millimetres (3/8 inch) thick. On the last occasion that the belt was renewed, which was in June 1969, it cost \$950 to replace.

Refrigeration is something we take for granted today, but mechanical refrigeration had a rather slow beginning. Although it can be traced back to the year 1755 it wasn't until 120 years later that Linde introduced the first successful Ammonia

Compression machines. Then it took almost a natural disaster to make the swing towards mechanical refrigeration - there was a shortage of natural ice during the American winter of 1890.

Prior to this, man harvested the natural ice crop in winter and stored it underground in caves to preserve his perishable foods during the summer months. Brewing then was restricted to the cooler months of the year. The developments of mechanical refrigeration by Linde and pasteurisation by Louis Pasteur (also in the late 19th century) revolutionised food processing in general and made brewing independent of the seasons.

Refrigeration capacity at the Milton Brewery has kept pace with the increase in beer production. In 1921 there was a 75 Ton (R) Refrigeration Compressor. Today there are four modern Centrifugal Compressors with a capacity for producing the equivalent of 2,400 tonnes of ice per day - more than a 30-fold increase,

Lancashire Boilers at the Fouxex Brewery in Milton, Brisbane

Amongst the major equipment installed early in this century in the Castlemaine Perkins (Fouxex) Brewery were three Lancashire boilers. By the time of the First World War, the allowable working pressure had been reduced possibly from about 150 lbs per square inch (1030kPa) to about 110 lbs per square inch (760kPa). The recorder of this information lamented that "the grade of coal was not good. In fact it was bad - half rock". This would have greatly increased the task of the

stokers, for rock is heavier than coal and the clinker would have had to be removed more frequently than it would have, if unadulterated coal was being burnt.

Once the First World War was over, it was time to replace these tired boilers and this was done in 1919. The same writer recorded that "it was a sad day when the old coal fired boilers were demolished as they had always been a favourite spot in the winter". The stokers, seen wielding their shovels, had an

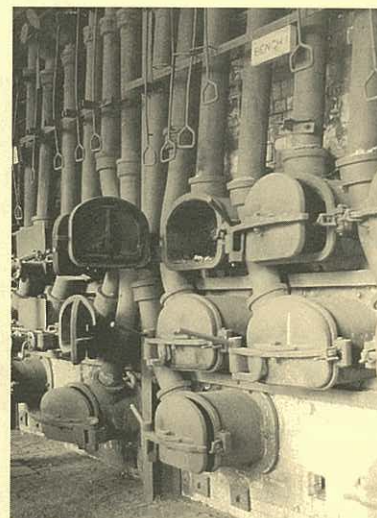
arduous task, for tending the furnaces of boilers in Brisbane's summer would be hot work indeed!

These boilers were built at Lancashire's works in England and would have cost about £550 (stg.) each. They were "fire tube" boilers, i.e. the flames and hot gases from the furnaces would have passed through the tubes, with the water outside the tubes.

The 9th National Conference on Engineering Heritage Ballarat, March 1998

The 9th Conference on Engineering Heritage was held in Ballarat in March last. Sixty six delegates attended, plus a further 38 accompanying persons; with 41 participating in the pre-conference tour. The conference was opened by Federal MP for Ballarat, Mr Michael Ronaldson who spoke on his grandfather's Ballarat company, Ronaldson & Tippet; a well known company in the past for various engineering projects. The keynote speaker was Dr. Jan Penny, Chairwoman of the Victorian Heritage Council, who presented a provocative paper on the preservation of historic structures. Twenty six papers were presented at the conference over three days, ranging over many facets of engineering heritage and all the major engineering disciplines.

The following is a list of the papers presented. Copies can be obtained by contacting the Institution in Canberra.



Black Coal Gas Works - Bendigo

- The Development of Ingersol and Rand, and Ingersol-Rand in Australia - J Whitehead
- Gold Dredging in Central Victoria - G Ralph
- Gold Mining Structures in New Zealand - G Thornton
- Issues in the Design and Construction of Wheelers Bridge, Lawrence - A Holgate, G Taplin & L Alves
- Joshua Thomas Noble Anderson (1865-1949), Engineer. A Biographical Sketch. - B Lloyd
- Victoria's Timber Bridges - D Chambers, K McInnes, M Churchward & D Moloney
- Engineering a City - D Kemp
- The Metropolis on the Swan River; Shaped by its Roads and Bridges. - L Edmonds
- Oliver Hill Coastal Artillery Battery Rotnest Island - J Paton
- Dams in Early Australia - F Kinstler
- Identifying Australia's Heritage Dams - B Cole, L Coltheart & A Moulds
- Edward Dobson and the Mass Concrete Gravity Dam on Stony Creek for the Geelong Water Supply - B Harper
- Some Professional Engineers Working in Auckland in the First Half of the Twentieth Century - P Lowe
- The Lydiard St Railway Gates Ballarat - The Drama of their Preservation - R Martin & G Hood
- Conservation Planning and a 1905 Electric Tramcar - W Doubleday
- The Land Rover in Australia: Post War Work Horse Turns 50. - A Maeder
- Rich Vein of Learning, An Historical Assessment of Ballarat's Role in Australian Engineering Education. - A Beggs-Sunter
- Engineering Heritage on the Rocks, Sydney - A Chapman
- Worlds Oldest Extant McNaught Beam Engine - F Lakin
- Industrial Refrigeration in the Adelaide Metropolitan and Hills Area: An Engineering Heritage Study. - A Ellis & J Pickles
- The Great Lake (Waddamana "A") Power Development in Tasmania - H Gilbert
- Reflections on Writing an Engineering Company History - T Williams
- The Engineering Heritage Associated with Coal Shipment from Newcastle 1877 to 1967 - P Cockbain
- Mining of Shale Oil at Joaja Creek and Glen Davis - A Hutton & L Knapman
- Construction and Restoration of the Brisbane Customs House - E Brown
- Training Project Managers in Heritage Management - J Longworth
- The Dilemma of Reuse of Obsolescent Industrial Complexes - J Lamborn

The Parkes Radio Telescope - a National Engineering Landmark

In the last issue we promised some information on the Parkes Radio Telescope, which was declared a National Engineering Landmark at a ceremony on 21 March 1997, by the then IEAust President Elect Barry Grear and the Hon. Peter McGauran, then Minister for Science and Technology.

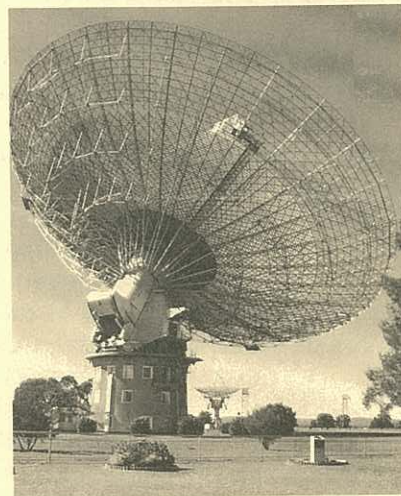
The telescope is part of the Australia Telescope National Facility (ATNF), operated by the CSIRO. The ATNF supports research into radio astronomy and runs the Australia Telescope, the collective name for a set of eight radio telescopes at three locations in New South Wales. The Telescope itself consists of six 22m diameter antennas near Narrabri, a seventh 22m diameter antenna near Coonabarabran, and the 64m radio telescope near Parkes.

During the plaquing ceremony, the Minister also launched the latest upgrade of the telescope - the new Multibeam Receiver System. This is an instrument that allows the telescope to detect thousands of previously unknown galaxies, by improving its ability to hunt for hydrogen gas in space.

Edward George 'Taffy' Bowen was born in Wales in 1911. He was one of the most dynamic and influential British physicists of his generation. Bowen joined the CSIR (later CSIRO) in 1944 and became Chief of its Radiophysics Laboratory in Sydney. Under him Radiophysics developed aircraft navigation aids and gained international reputations in both cloud physics and the new science of radio astronomy.

Bowen's vision led to the building of the Parkes 64m dia. radio telescope. He also played a key role in managing the design development of the Anglo-Australian Telescope, Australia's premier optical telescope.

Bowen, who died in 1991, was accorded many honours including OBE, Medal of Freedom (USA) and the CBE.



The plinth on which the plaques are mounted is in the foreground. The Information Plaque reads:

Radio Telescope, Parkes

This 64 metre telescope is the realisation of the vision of CSIRO's Dr E.G. Bowen. Designed by Freeman Fox & Partners to a CSIRO specification and built by Maschinenfabrik Augsburg Nurnberg (MAN), many of its features were adopted in later telescopes. Commissioned in 1961, it has allowed astronomers to explore the universe in greater detail than ever before. Excellent engineering and the latest in electronics and computing have kept this telescope at the forefront of radio astronomy.

Dedicated by The Institution of Engineers, Australia and CSIRO, 1997

Heritage on the Web: IEAust Heritage Home Pages

Alan Schmierer of Canberra Division is currently working with the Webmaster to establish the National Engineering Heritage Committee's home page on The Institution's Web Site.

The Page will include information about:

- The Institution and Engineering Heritage
- The National Committee on Engineering Heritage
- Membership of the Committee, its office bearers and where enquiries can be made
- Divisional Engineering Heritage Committees
- The Historic Engineering Plaquing Program, a list and details of all the works plaqued
- The Oral History Program including descriptions of programs run by Divisional Committees and lists of those interviewed

- Engineering heritage publications and where they may be purchased
- A copy of the Committee's latest newsletter - *Engineering Heritage Australia* with an index of articles
- A calendar of activities
- Heritage news and comment

There will also be links to websites throughout the world with similar interests.

Ian Arthur has already established Sydney Division's Engineering Heritage Committee's page and this can be found at:

www.ieaust.org.au/divisions/syd/com_heritage/index_heritage.htm

Dams on the Cotter

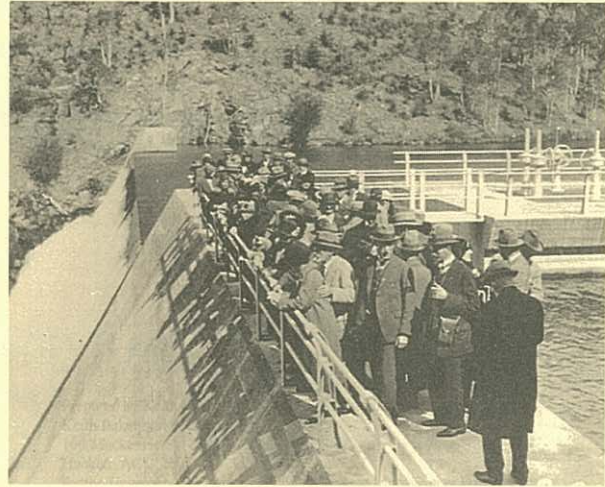
The selection of the site for the national capital was profoundly influenced by the availability of a good water supply. The pristine Cotter River provided a mountain catchment and the river has now been the site of the construction of three dams, Cotter in 1912 (raised in 1949), Bendora in 1959, and Corin in 1966.

Dams on the Cotter is an oral history project undertaken by Canberra Division Heritage Panel in 1997 capturing 25 stories of engineers, surveyors, tradesmen, labourers, contractors and others associated with the design and construction works since 1949.

The works were all undertaken by the Commonwealth department construction agency of the time. With the winding down of the Snowy Mountains scheme in the late 50's, many of the dam builders found new opportunities on the Bendora and Corin developments, bringing with them a wealth of experience and expertise.



The final pipe is laid, joining the pipeline to the outlet valve at Bendora Dam, November 1967



Cotter Dam

Dams on the Cotter was funded by the ACT Heritage Council and ACTEW Corporation, and was undertaken by local historian Matthew Higgins. Transcripts of the oral interviews are bound into a 200 page final report which also includes comprehensive information of the design parameters, construction details and photographs. A display of photographs and text captions for public exhibition was also produced and has been on tour throughout the ACT.

For more information contact Bob Harvey at Canberra Division

Kingston Power Station

On Saturday 4 April, ACT Chief Minister Kate Carnell unveiled an Historic Engineering Marker (HEM) plaque on the Kingston Power Station before a large audience. The station was nominated for the award by the Canberra Division of the Institution under the Historic Engineering Plaquing Programme.



"Part of the large crowd at the Kingston ceremony".

Designed for the Federal Government's Department of Home Affairs and completed in 1915, the station was the first permanent building constructed in the national capital. It was a valuable source of prime and standby electric power for 47 years. The station is a symbol of the contribution engineering has made to the building and development of the capital and is an important part of Canberra's heritage.

In her address, Mrs Carnell spoke eloquently about the station, the engineering profession's contribution to society and the future plans for the site as part of the Kingston foreshore development project.

At about midday on Tuesday 22 October 1872, a message for Messrs McEwan & Co of Melbourne was received by the operators in the newly-built telegraph room on the first floor of the Adelaide GPO. It was the first message from overseas to be sent via the Overland Telegraph Line. Later that afternoon the Lord Mayor of London sent a congratulatory cable to the Mayor of Adelaide. It arrived only seven hours after leaving London. The "tyranny of distance" of the remote Australian colonies was eroded forever.

The Overland Telegraph was a tremendous coup for South Australia. The Government had snatched the line from the other colonies and this gave Adelaide a prime position in the flow of information into and out of Australia. Fluctuating demand and prices for exports and imports were no longer a problem and many commercial fortunes made. Within six months of opening the line, South Australia was able to arrange wheat sales to foreign countries and crop earned a quarter of a million pounds more than it would otherwise have. News reports from Reuters in London could also be received in Adelaide. On 24 October 1872, the Advertiser printed reports from London dated 21 and 22 October. Thereafter, London cables were published every day.

Charles Todd, then Postmaster-General of South Australia, received much of the credit for this historic engineering achievement. He planned and managed the mammoth project of erecting almost 3000 kilometres of telegraph line and 36,000 poles in less than two years.

On 15 November 1872, the officers and men of the Overland Telegraph party met Todd in the quadrangle of the new General Post Office, then marched along King William Street to the Exhibition Grounds - in scenes not unlike the triumphant return of the Adelaide Crows. During a celebratory banquet in the Town Hall, telegraph messages were exchanged with London and the replies took only two hours to arrive.

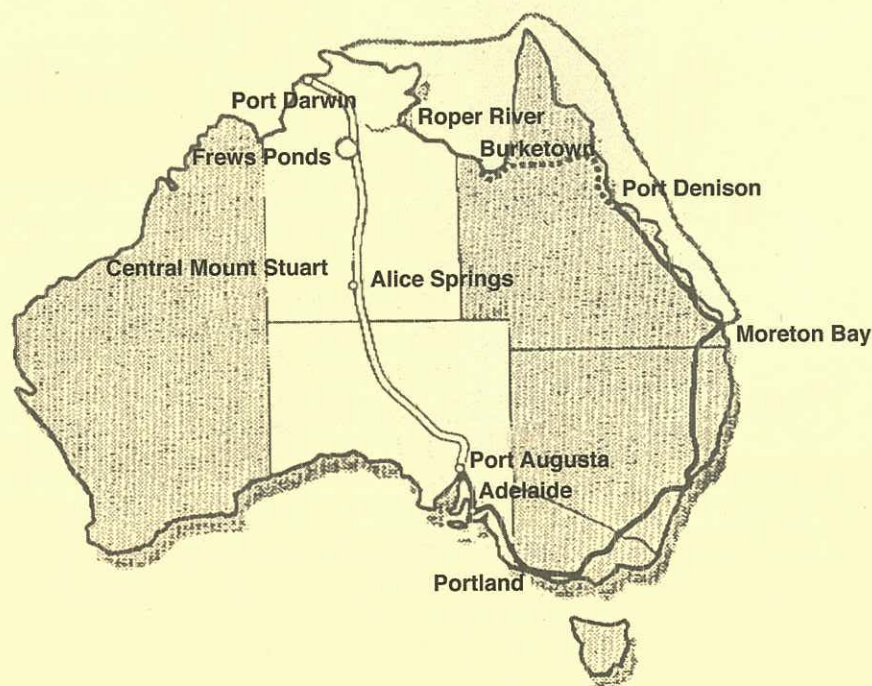
The electric telegraph was one of the first practical applications of electricity. the work of telegraph engineers rapidly brought the commercial and social benefits of rapid, long distance communication to the people of Europe and America. They also made a significant contribution to community safety by developing city fire alarm systems and railway signalling. These early telegraph engineers were the forerunners of today's electrical and electronic engineers.

The Overland Telegraph

South Australia Division Heritage Committee recently celebrated the historic Overland Telegraph in an unusual way. They held a commemorative dinner at which speeches and menu celebrated the construction of this 1872 link to the rest of the world.

During the evening telegraph messages were transmitted in Morse Code between the dinner in Adelaide and a corresponding dinner being held in Darwin at Lyons Cottage, the former office of the Eastern Extension Australasia and China Telegraph Company. There was also a telephone hook-up to a dinner being held at the old Telegraph Station at Alice Springs.

The Overland Telegraph Significant Locations



Port Darwin

Termination point of the undersea cable from Timor

Roper River

Closest supply point for ships from Adelaide

Frews Ponds

Site of the final connection of the Overland Telegraph

Central Mount Stuart

Site of Todd's communications with Adelaide

Alice Springs

Site of the telegraph station named after Todd's wife

Port Augusta

Starting point for the southern section

Adelaide

Site of General Post Office

Portland

Interconnection point between South Australia and Victoria

Moreton Bay

Proposed termination point of overseas cable

Port Denison

Northern extent of Queensland telegraph system

Burketown

Rival starting point for the land line